National Institute of Environmental Health Sciences

Climate change increases deoxynivalenol contamination of wheat in north-western Europe

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Abstract:

Climate change will affect the development of cereal crops and the occurrence of mycotoxins in these crops, but so far little research has been done on quantifying the expected effects. The aim of this study was to assess climate change impacts on the occurrence of deoxynivalenol in wheat grown in north-western Europe by 2040, considering the combined effects of shifts in wheat phenology and climate. The study used climate model data for the future period of 2031-2050 relative to the baseline period of 1975-1994. A weather generator was used for generating synthetic series of daily weather data for both the baseline and the future periods. Available models for wheat phenology and prediction of deoxynivalenol concentrations in north-western Europe were used. Both models were run for winter wheat and spring wheat, separately. The results showed that both flowering and full maturation of wheat will be earlier in the season because of climate change effects, about 1 to 2 weeks. Deoxynivalenol contamination was found to increase in most of the study region, with an increase of the original concentrations by up to 3 times. The study results may inform governmental and industrial risk managers to underpin decision-making and planning processes in north-western Europe. On the local level, deoxynivalenol contamination should be closely monitored to pick out wheat batches with excess levels at the right time. Using predictive models on a more local scale could be helpful to assist other monitoring measures to safeguard food safety in the wheat supply chain.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES), Other Climate Scenario

Special Report on Emissions Scenarios (SRES) Scenario: SRES A1

Other Climate Scenario: A1B

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Quality

Food/Water Quality: Biotoxin/Algal Bloom, Chemical

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Region

Other European Region: north-western Europe

Health Co-Benefit/Co–Harm (Adaption/Mitigation):

specification of beneficial or harmful impacts to health resulting from efforts to reduce or cope with greenhouse gases

A focus of content

Health Impact:

specification of health effect or disease related to climate change exposure

Other Health Impact

Other Health Impact: Mycotoxins

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Mitigation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content